

Complete Summary

GUIDELINE TITLE

Managing elevated blood lead levels among young children: recommendations from the Advisory Committee on Childhood Lead Poisoning Prevention.

BIBLIOGRAPHIC SOURCE(S)

Centers for Disease Control and Prevention (CDC). Managing elevated blood lead levels among young children: recommendations from the Advisory Committee on Childhood Lead Poisoning Prevention. Atlanta (GA): Centers for Disease Control and Prevention (CDC); 2002 Mar. 128 p. [53 references]

GUIDELINE STATUS

This is the current release of the guideline.

COMPLETE SUMMARY CONTENT

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SCOPE

DISEASE/CONDITION(S)

Elevated blood lead levels (defined as greater than or equal to 10 micrograms/dL)

GUIDELINE CATEGORY

Counseling
 Evaluation
 Management
 Prevention
 Risk Assessment
 Screening

CLINICAL SPECIALTY

Family Practice
Internal Medicine
Pediatrics
Preventive Medicine

INTENDED USERS

Allied Health Personnel
Managed Care Organizations
Nurses
Physicians
Public Health Departments
Social Workers

GUIDELINE OBJECTIVE(S)

To facilitate the management of children with elevated blood lead levels

TARGET POPULATION

Children aged 1 to 5 years with elevated blood lead levels

INTERVENTIONS AND PRACTICES CONSIDERED

Evaluation

1. Blood lead level monitoring
2. Complete history and physical exam
3. Complete neurological exam
4. Laboratory investigations
 - Hemoglobin or hematocrit
 - Iron status
 - Free erythrocyte protoporphyrin (FEP) or erythrocyte zinc protoporphyrin (ZPP) levels
5. Environmental investigation
 - Inspection of home and other sites where child spends significant amounts of time
 - History of exposure
 - Measurements of environmental lead levels
6. Neurodevelopmental monitoring
7. Abdominal X-ray with bowel decontamination if indicated
8. Nutritional assessment and diet evaluation

Management/Treatment and Prevention

1. Education of caregivers to risks and sources of lead poisoning
2. Dietary modifications and supplementation
3. Chelation therapy
4. Hospitalization

5. Referral to early intervention/stimulation programs
6. Lead hazard reduction and control
 - House dust control
 - Safe removal of lead paint
 - Temporary occupant relocation
 - Clearance testing prior to reoccupation
 - Relocation to lead-safe housing
7. Monitoring and follow-up
8. Advocacy on behalf of child to local and national government

Interventions considered but not recommended included: searching for gingival lead lines; testing of hair, teeth, or fingernails for lead; testing of neurophysiologic function; radiographic imaging of long bones; evaluation of renal function (except during chelation with ethylenediaminetetraacetic acid [EDTA]); x-ray fluorescence of long bones.

MAJOR OUTCOMES CONSIDERED

- Blood lead levels
- Incidence of lead poisoning
- Cognitive function
- Morbidity due to elevated blood levels

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

Not stated

NUMBER OF SOURCE DOCUMENTS

Not stated

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Expert Consensus

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Not applicable

METHODS USED TO ANALYZE THE EVIDENCE

Systematic Review with Evidence Tables

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Not stated

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

Experts in each subject area were asked to summarize recommended case management actions; to provide a detailed, referenced basis for their recommendations; and to suggest the most important areas for future research to support, modify, or eliminate poorly justified or empirically based recommendations.

Recommendations in each chapter are based on the results of evidence-based studies wherever possible. The most convincing basis for a specific recommendation is data from prospective, randomized, controlled trials. Unfortunately, such data are scarce; therefore, experts who developed each chapter had to rely primarily on softer data from cross-sectional studies, cohort or case controlled studies, uncontrolled studies, epidemiologic data, and--if appropriate--case reports or animal studies. They were also asked to note whether studies of interventions used to support their recommendations were efficacy studies (studies performed under ideal conditions) or effectiveness studies (studies performed in ordinary settings).

In the absence of sufficient study data, the opinions of respected authorities were considered in the formulation of these recommendations. Recommendations, particularly those not based on controlled studies, were often modified by the Advisory Committee on Childhood Lead Poisoning Prevention (ACCLPP) working group and subsequently by the full committee. Thus, in their final form, the recommendations in this report represent the consensus of the ACCLPP rather than individual opinions of the authors of each chapter.

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

COST ANALYSIS

A formal cost analysis was not performed and published cost analyses were not reviewed.

METHOD OF GUIDELINE VALIDATION

External Peer Review
Internal Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

The document was reviewed at meetings attended by Advisory Committee on Childhood Lead Poisoning Prevention (ACCLPP) members, ex officio members, liaison representatives, and chapter authors. Changes requested by attendees were incorporated in the final document.

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

Assessment and Remediation of Residential Lead Exposure

Summary of Recommendations

Make prompt and effective environmental management for children with elevated blood lead levels (EBLLs) the highest priority of all childhood lead poisoning prevention programs.

1. Conduct an environmental investigation for all children with blood lead levels ≥ 20 micrograms/dL, or persistently ≥ 15 micrograms/dL. This investigation should include:
 - a. An inspection of the child's home and other sites where the child spends significant amounts of time
 - b. A history of the child's exposure
 - c. Measurements of environmental lead levels, including at a minimum
 - i. House dust
 - ii. Paint that is not intact or is subject to friction
 - iii. Exposed soil, especially in play areas
 - iv. Other media as appropriate
2. Ensure that interventions to reduce ongoing exposure:
 - a. Focus on control of current lead hazards
 - b. Include prompt interim measures (e.g., house dust control by professional cleaners) where appropriate, to rapidly reduce lead exposure
 - c. Be performed in accordance with safe practices by trained workers to avoid increasing lead exposure to occupants and workers
 - d. Keep to a minimum on-site removal of intact leaded paint
 - e. Replace or enclose building components when elimination of intact leaded paint is performed
 - f. Include clearance testing following lead hazard reduction work to ensure that lead levels are safe prior to a structure being re-occupied
 - g. Include temporary occupant relocation or other measures to protect occupants from exposure to leaded dust produced by lead hazard control activities
 - h. Relocate children permanently to lead-safe housing if necessary to reduce their lead exposure in a timely manner
3. Encourage state and local governments to assess the effectiveness of their laws, ordinances, housing codes, and enforcement structures in dealing with identified lead hazards and to identify changes required to ensure that children are protected.

4. Promote the expansion of existing federal, state, and local subsidies to help finance lead hazard control in economically distressed communities, and the creation of new subsidies, if necessary.

Time Frames for Environmental Investigation and Other Case Management Activities According to a Child's Blood Lead Level (BLL)^a

Blood Lead Level (micrograms/dL) ^b	Actions	Time Frame for Beginning Intervention
10-14	<ul style="list-style-type: none"> • Provide caregiver lead education. • Provide follow-up testing. • Refer the child for social services if necessary. 	Within 30 days
15-19	<p>Above actions, plus:</p> <ul style="list-style-type: none"> • If BLLs persist (i.e., 2 venous BLLs in this range at least 3 months apart) or increase, proceed according to actions for BLLs 20-44. 	Within 2 weeks
20-44	<p>Above actions, plus:</p> <ul style="list-style-type: none"> • Provide coordination of care (case management). • Provide clinical evaluation and care.^c • Provide environmental investigation and control current lead hazards. 	Within 1 week
45-70	Above actions.	Within 48 hours
70 or higher	Above actions, plus hospitalize child for chelation therapy immediately.	Within 24 hours

^aThe Advisory Committee on Childhood Lead Poisoning Prevention (ACCLPP) encourages programs to develop methods to deliver environmental assessment services to caregivers for children living in high-risk dwellings regardless of the children's blood lead levels.

^bMicrograms per deciliter of whole blood measured in a venous sample collected following an elevated screening measurement.

^cThe recommended clinical evaluation is described in Chapter 3 of the original guideline document, "Medical Assessment and Interventions."

Medical Assessment and Interventions

Summary of Recommendations for Children with Confirmed (Venous) Elevated Blood Lead Levels

Blood Lead Level (micrograms/dL)			
10-14	15-19	20-44	45-70
<ul style="list-style-type: none"> Lead education <ul style="list-style-type: none"> Dietary Environmental Follow-up blood lead monitoring 	<ul style="list-style-type: none"> Lead education <ul style="list-style-type: none"> Dietary Environmental Follow-up blood lead monitoring Proceed according to actions for 20–44 micrograms/ dL if: <ul style="list-style-type: none"> A follow-up BLL is in this range at least 3 months after initial venous test Or BLLs increase 	<ul style="list-style-type: none"> Lead education <ul style="list-style-type: none"> Dietary Environmental Follow-up blood lead monitoring Complete history and physical exam Lab work: <ul style="list-style-type: none"> Hemoglobin or hematocrit Iron status Environmental investigation Lead hazard reduction Neurodevelopmental monitoring Abdominal x-ray (if particulate lead ingestion is suspected) with bowel decontamination if indicated 	<ul style="list-style-type: none"> Lead education <ul style="list-style-type: none"> Dietary Environmental Follow-up blood lead monitoring Complete history and physical exam Lab work: <ul style="list-style-type: none"> Hemoglobin or hematocrit Iron status Environmental investigation Lead hazard reduction Neurodevelopmental monitoring Abdominal x-ray (if particulate lead ingestion is suspected) with bowel decontamination if indicated Chelation therapy

The following actions are NOT recommended at any blood lead level:

- Searching for gingival lead lines
- Testing of neurophysiologic function
- Evaluation of renal function (except during chelation with ethylenediaminetetraacetic acid [EDTA])
- Testing of hair, teeth, or fingernails for lead
- Radiographic imaging of long bones
- X-ray fluorescence of long bones

Recommended Schedule for Obtaining a Confirmatory Venous Sample

Screening test result (micrograms/dL)	Perform a confirmation test within:
10-19	3 months
20-44	1 week to 1 month ^a
45-59	48 hours
60-69	24 hours
>70	Immediately as an emergency lab test

^aThe higher the BLL on the screening test, the more urgent the need for confirmatory testing.

Schedule for Follow-Up Blood Lead Testing^a

Venous blood lead level (micrograms/dL)	Early follow-up (first 2 to 4 tests after identification)	Late follow-up (after BLL begins to decline)
10-14	3 months ^b	6 to 9 months
15-19	1 to 3 months ^b	3 to 6 months
20-24	1 to 3 months ^b	1 to 3 months
25-44	2 weeks to 1 month	1 month
>45	As soon as possible	Chelation with subsequent follow-up

^aSeasonal variation of BLLs exists and may be more apparent in colder climate areas. Greater exposure in the summer months may necessitate more frequent follow ups.

^bSome case managers or primary care providers (PCPs) may choose to repeat blood lead tests on all new patients within a month to ensure that their BLL level is not rising more quickly than anticipated.

Nutritional Assessment and Interventions

Summary of Recommendations

Nutritional measures have not yet been proven to have a clinically important impact on elevated blood lead levels (EBLLs) in children. However, children with EBLLs are often at risk for poor nutrition, and their caregivers should receive nutritional counseling to help these children obtain a well-balanced and age-appropriate diet.

Assessment

- Test children at risk for anemia (e.g., those from low income, migrant, or recently arrived refugee families, or those qualifying for the Special Supplemental Nutrition Program for Women, Infants, and Children [WIC]).
 - Between ages 9 and 12 months
 - 6 months later
 - Annually from ages 2 to 5 years
- Evaluate the diet of children at risk for anemia, paying particular attention to dietary iron, vitamin C, and calcium.

Interventions

- Evaluate the WIC eligibility of children with EBLLs and ensure their access to this program if eligible.
- Advise caregivers to provide children with an adequate intake of iron-containing foods. Recommend that they:
 - Introduce pureed meats as soon as the child is developmentally ready.
 - Provide one serving of lean red meat per day to older children.
 - Provide supplements only under the supervision of a physician or nutritionist and only when anemia or iron deficiency is documented.

- Encourage caregivers to provide children with adequate intake of vitamin C-containing foods. Recommend that they:
 - Provide two servings of fruit juices or fruits per day.
 - Provide supplements only under the supervision of a physician or nutritionist.
- Encourage caregivers to provide children with adequate intake of calcium (500 mg/day at 1 to 3 years; 800 mg/day at 4 to 8 years). Recommend that they:
 - Provide two servings per day of dairy products or other calcium-rich foods.
 - Provide supplements only under the supervision of a physician or nutritionist.

Always keep recommended interventions within the ability of the caregiver to implement them.

Developmental Assessment and Interventions

Summary of Recommendations

- Make long term developmental surveillance a component of the management plan for any child with a BLL ≥ 20 micrograms/dL, while recognizing that this will not necessarily result in referral for diagnostic assessment or intervention.
- Also consider developmental surveillance for a child who has a BLL that does not exceed 20 micrograms/dL but who has other significant developmental risk factors.
- Do not base decisions regarding developmental assessment or intervention on a child's age at the time the child is found to have an EBLL.
- If you wish to refer a child with an EBLL for intervention services, consider referring that child to early intervention/stimulation programs.
- Include a history of a child's EBLL in the problem list maintained in the child's medical record.
- Do not stop developmental surveillance when a child with an EBLL reaches age 6 or when the child's blood lead level is reduced. A responsible party (e.g., the child's PCP) should provide ongoing developmental surveillance of that child after the EBLL case is closed.
- In the developmental surveillance of children with EBLLs:
 - Watch for emerging difficulties at critical transition points in childhood: first, fourth, and sixth/seventh grades.
 - Watch for behaviors that interfere with learning, such as inattention and distractibility.
- Refer children experiencing neurodevelopmental problems for a thorough diagnostic evaluation.
- Be advocates for the child.

Educational Interventions for Caregivers

Summary of Recommendations

General Considerations

- Tailor educational interventions to each child and caregiver.

- Repeat educational interventions as needed.

Environmental Interventions

- Provide information about potential sources of lead identified during environmental investigations.
- Explain that lead abatement should be conducted by certified professionals.
- Discuss and demonstrate the following methods that caregivers can use to reduce their child's lead exposure:
 - Create barriers between living/play areas and lead sources.
 - Regularly wash children's hands and toys.
 - Regularly wet mop floors and wet wipe window components.
 - Vacuum carpeted areas before wet mopping floors; cover carpeted floors with throw rugs.
 - Leave shoes at the door. Use entryway mats.
 - Prevent children from playing in soil. If possible, provide sandboxes.
 - Consider relocation if lead contamination is extensive and not easily remediable.
- Discuss with caregivers potential water hazards only if appropriate.
 - Do not cook with or allow children to drink hot tap water.
 - Run the tap water cold for 1 to 2 minutes in the morning and then fill a pitcher with the water for drinking, cooking, and formula preparation.
 - Use bottled water if drinking water is contaminated.

Nutritional Interventions

- Discuss dietary interventions.
- Encourage caregivers to provide children with foods rich in absorbable iron, vitamin C, and calcium.

Medical Care

- Discuss the importance of recommended medical follow-up, including the importance of notifying the case manager if the family moves.
- Review the nature of and risks associated with EBLLs.

CLINICAL ALGORITHM(S)

None provided

EVIDENCE SUPPORTING THE RECOMMENDATIONS

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

Recommendations are based on the results of evidence-based studies wherever possible. In the absence of sufficient study data, the opinions of respected authorities were considered in the formulation of these recommendations. The type of supporting evidence is not specifically stated for each recommendation.

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

Detection of elevated blood lead levels in children enables early interventions that may reduce blood lead levels and prevent further lead exposure to the patient and family members.

Subgroups Most Likely to Benefit

Children under 2 years of age will achieve the most benefit from implementation of these recommendations because neurotoxicity is greater and lead exposure is more likely to result in a rapid increase in blood lead levels in very young children.

POTENTIAL HARMS

Possible adverse effects of chelation therapy

QUALIFYING STATEMENTS

QUALIFYING STATEMENTS

There are several guiding principles to consider when making recommendations for children with elevated blood lead levels (EBLLs). First, interventions should be directed at children whose risk for lead exposure is high. Second, where possible, interventions should be targeted at children less than 2 years old because neurotoxicity is greater and lead exposure is more likely to result in a rapid increase in BLLs in very young children. Finally, when intervention recommendations are based on tenuous data or on expert opinion, as are some in this document, case managers and other involved professionals should more than ever remember *primum non nocere* (first, do no harm). Most children with EBLLs come from economically disadvantaged families who may have difficulty meeting the daily challenges of life and who may be overwhelmed if presented with a long list of interventions. Further, as has been found in many studies of interventions to combat other childhood problems (injury prevention, dietary counseling), behavioral change recommendations usually have only a modest effect at best. Thus, better results may be achieved by focusing on the most important recommendations (usually those designed to eliminate environmental lead hazards) and assisting caregivers in implementing them. Encouraging and supporting families without making them feel guilty for their child's EBLL or making unrealistic demands on them may offer the greatest benefit to the child.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

General principles for implementation of case management services to children at risk for elevated blood levels are provided in Chapter 1 of the original guideline document. In addition, each chapter of the guideline provides specific implementation strategies for the recommended interventions.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Getting Better
Staying Healthy

IOM DOMAIN

Effectiveness
Patient-centeredness
Timeliness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

Centers for Disease Control and Prevention (CDC). Managing elevated blood lead levels among young children: recommendations from the Advisory Committee on Childhood Lead Poisoning Prevention. Atlanta (GA): Centers for Disease Control and Prevention (CDC); 2002 Mar. 128 p. [53 references]

ADAPTATION

Not applicable: The guideline was not adapted from another source.

DATE RELEASED

2002 Mar

GUIDELINE DEVELOPER(S)

Centers for Disease Control and Prevention - Federal Government Agency [U.S.]
Department of Health and Human Services (U.S.) - Federal Government Agency [U.S.]
Public Health Service (U.S.) - Federal Government Agency [U.S.]

SOURCE(S) OF FUNDING

United States Government

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Advisory Committee on Childhood Lead Poisoning Prevention

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FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

GUIDELINE STATUS

This is the current release of the guideline.

GUIDELINE AVAILABILITY

Electronic copies: Available from the [Centers for Disease Control and Prevention \(CDC\) Web site](https://www.cdc.gov).

Print copies: Available from the Centers for Disease Control and Prevention, MMWR, Atlanta, GA 30333. Additional copies can be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402-9325; (202) 783-3238.

AVAILABILITY OF COMPANION DOCUMENTS

The following are available:

- Facts on ... lead. Atlanta (GA): Centers for Disease Control and Prevention (CDC); 2002 Mar. Electronic copies: Available from the [Centers for Disease Control and Prevention \(CDC\) Web site](#).
- Questions and answers on CDC's new case management guidelines. Atlanta (GA): Centers for Disease Control and Prevention (CDC); 2002 Mar. Electronic copies: Available from the [Centers for Disease Control and Prevention \(CDC\) Web site](#).

PATIENT RESOURCES

None available

NGC STATUS

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